Results of observations, etc.—Continued.

Number and chronological order of observation.	Poulkova mean time.	Barometric record. Temperature 0° C.	Temperature, C. Thermometer No. 5, corrected.	Temperature, C. Thermometer No. 145, corrected.	Temperature, C. Adopted temperature.	Relative humidity.	Vapor tension.	Altitude determined barometrically.
1	2	3	4	5	6	7	8	9
	h. m. s.	mm.	°	°	°	%	mm.	Meters.
21	3 36 17	.....	.....	− 0.5	.....	.....	.....	.....
	3 36 33	.....	.....	.....	.....	29	.....	.....
22	3 36 50	518.4	.....	.....	− 0.8	(29)	1.3	3,257.4
	3 37 22	516.4	.....	.....	− 0.2	(29)	1.3	3,287.9
	3 38 8	.....	0.0	.....	.....	.....	.....	.....
	3 38 22	.....	.....	.....	.....	29	.....	.....
	3 38 36	.....	.....	− 0.4	.....	.....	.....	.....
	3 38 51	514.8	.....	.....	− 0.5	(29)	1.2	3,312.5
23	3 41 9	508.2	.....	.....	− 1.0	(29)	1.3	3,414.4
	3 41 39	.....	.....	− 1.1	.....	.....	.....	.....
	3 41 49	.....	.....	.....	.....	28.5	.....	.....
24	3 41 59	506.2	.....	.....	− 1.3	(29)	1.2	3,445.4
	3 43 22	.....	.....	.....	.....	28.5	.....	.....
	3 43 26	.....	.....	− 2.4	.....	.....	.....	.....
	3 44 4	503.7	.....	.....	− 1.6	(29)	1.2	3,484.0
	3 44 24	.....	.....	− 1.2	.....	.....	.....	.....
	3 45 1	.....	.....	.....	.....	28.5	.....	.....
25	3 45 48	.....	− 0.7	.....	.....	.....	.....	.....
26	3 48 26	494.5	.....	.....	+ 0.1	(29)	1.3	3,629.4
	3 48 50	.....	.....	+ 0.2	.....	.....	.....	.....
27	3 49 45	.....	.....	− 0.5	.....	.....	.....	.....
	3 50 23	.....	.....	− 1.7	.....	.....	.....	.....
	3 50 52	486.9	.....	.....	− 1.7	(29)	1.2	3,752.2
	3 51 21	.....	.....	.....	.....	28.5	.....	.....
28	3 52 3	481.8	.....	.....	− 1.5	(29)	1.2	3,835.4
	3 52 47	.....	.....	− 1.5	.....	.....	.....	.....
	3 53 1	.....	.....	.....	.....	28.5	.....	.....
29	3 54 43	479.5	.....	.....	− 3.7	(28)	1.0	3,873.1
30	3 57 40	.....	.....	− 5.5	.....	.....	.....	.....
	3 57 57	484.4	.....	.....	− 5.5	(28)	0.9	3,790.4
31	3 58 28	.....	.....	− 5.6	.....	.....	.....	.....
	3 58 43	.....	.....	.....	.....	28	.....	.....
32	3 59 59	490.0	.....	.....	− 5.5	(28)	0.9	3,699.9
	4 0 42	.....	.....	.....	.....	29	.....	.....
33	4 7 23	.....	.....	− 5.0	.....	.....	.....	.....
	4 7 52	.....	.....	.....	.....	28.5	.....	.....
34	4 8 6	495.0	.....	.....	− 4.6	(28)	0.9	3,618.8
	4 9 3	.....	.....	− 4.0	.....	.....	.....	.....
35	4 11 13	.....	.....	− 3.2	.....	.....	.....	.....
	4 11 42	507.7	.....	.....	− 3.1	(28)	1.0	3,415.0
36	4 12 23	.....	.....	− 3.0	.....	.....	.....	.....
	4 12 39	.....	.....	.....	.....	28.5	.....	.....
	4 12 52	511.0	.....	.....	− 3.8	(28)	1.0	3,364.0
37	4 13 19	.....	.....	− 4.1	.....	.....	.....	.....
	4 13 34	.....	.....	.....	.....	28	.....	.....
38	4 13 49	518.1*	.....	.....	− 3.8	(28)	1.0	3,266.9
	4 14 4	.....	.....	− 3.7	.....	.....	.....	.....
39	4 14 34	533.1*	.....	.....	− 3.1	(28)	1.0	3,040.6
	4 14 48	.....	.....	− 3.0	.....	.....	.....	.....
40	4 16 19	543.3*	.....	.....	− 0.5	(28)	1.2	2,889.0
	4 16 33	.....	.....	− 0.5	.....	.....	.....	.....
41	4 17 59	548.4*	.....	.....	+ 0.5	(28)	1.3	2,813.4
	4 18 9	.....	+ 0.5	.....	.....	.....	.....	.....
	4 18 19	.....	.....	+ 1.0	.....	.....	.....	.....
42	4 18 53	.....	.....	+ 1.5	.....	.....	.....	.....
43	4 19 35	558.4*	.....	.....	+ 2.1	(28)	1.6	2,667.2
	4 19 42	.....	.....	+ 2.2	.....	.....	.....	.....
	4 19 48	.....	.....	.....	.....	28.5	.....	.....
44	4 20 7	568.5*	.....	.....	+ 2.2	(28)	1.6	2,522.2
	4 20 20	.....	.....	+ 2.2	.....	.....	.....	.....
45	4 21 15	.....	.....	+ 2.8	.....	.....	.....	.....
46	4 22 41	578.6*	.....	.....	+ 2.5	(28)	1.6	2,378.6
	4 22 55	.....	.....	+ 2.5	.....	.....	.....	.....
	4 23 9	.....	.....	.....	.....	28	.....	.....
47	4 27 53	.....	.....	+ 1.2	.....	.....	.....	.....
	4 28 22	.....	.....	.....	.....	27	.....	.....
48	4 30 41	568.5	.....	.....	+ 2.4	(27)	1.5	2,514.2
	4 30 55	.....	.....	+ 2.5	.....	.....	.....	.....
	4 31 10	565.4	.....	.....	+ 2.6	(27)	1.5	2,558.8
49	4 32 11	.....	.....	+ 3.0	.....	.....	.....	.....
	4 32 30	.....	.....	.....	.....	26	.....	.....
50	4 32 40	560.1	.....	.....	+ 2.7	(26)	1.5	2,621.3
	4 33 28	.....	.....	+ 2.1	.....	.....	.....	.....
	4 33 42	.....	.....	.....	.....	26	.....	.....
	4 33 57	556.5	.....	.....	+ 2.0	(26)	1.5	2,612.3
51	4 35 56	544.3	.....	.....	+ 1.3	(26)	1.3	2,849.3
	4 36 9	.....	.....	.....	.....	26	.....	.....
52	4 36 59	.....	.....	+ 0.7	.....	.....	.....	.....
	4 37 12	538.7	.....	.....	+ 0.8	(26)	1.3	2,931.3
53	4 37 39	536.9*	.....	.....	+ 1.1	(26)	1.3	2,957.7
	4 37 53	.....	.....	+ 1.2	.....	.....	.....	.....
54	4 38 54	.....	.....	− 0.4	.....	.....	.....	.....
	4 39 4	.....	+ 0.2	.....	.....	.....	.....	.....
55	4 39 40	526.1*	.....	.....	− 0.8	(25)	1.1	3,119.3
	4 40 7	.....	.....	− 1.0	.....	.....	.....	.....
	4 40 33	.....	.....	.....	.....	25	.....	.....
	4 40 59	.....	− 0.9	.....	.....	.....	.....	.....
	4 41 6	.....	.....	− 1.2	.....	.....	.....	.....
56	4 42 21	.....	.....	− 0.7	.....	.....	.....	.....
	4 42 36	.....	− 0.5	.....	.....	.....	.....	.....
	4 42 51	.....	.....	.....	.....	25	.....	.....
57	4 43 20	514.8*	.....	.....	+ 0.2	(25)	1.1	3,290.0
	4 43 35	.....	.....	+ 0.5	.....	.....	.....	.....
	4 43 50	.....	.....	.....	.....	25	.....	.....
	4 44 5	510.0	.....	.....	+ 0.5	(25)	1.2	3,358.2

Results of observations, etc.—Continued.

Number and chronological order of observation.	Poulkova mean time.	Barometric record. Temperature 0° C.	Temperature, C. Thermometer No. 5, corrected.	Temperature, C. Thermometer No. 145, corrected.	Temperature, C. Adopted temperature.	Relative humidity.	Vapor tension.	Altitude determined barometrically.
1	2	3	4	5	6	7	8	9
	h. m. s.	mm.	°	°	°	%	mm.	meters.
57	4 44 20	.....	.....	+ 0.5	.....	.....	.....	.....
	4 44 50	509.0	.....	.....	− 0.1	(25)	1.1	3,379.7
	4 45 4	.....	.....	.....	.....	25	.....	.....
	4 45 34	.....	.....	− 0.9	.....	.....	.....	.....
58	4 46 4	.....	− 1.1	.....	.....	.....	.....	.....
59	4 46 35	505.1*	.....	.....	− 1.2	(25)	1.1	3,439.8
	4 46 50	.....	.....	− 1.2	.....	.....	.....	.....
	4 47 6	.....	− 1.5	.....	.....	.....	.....	.....
	4 47 21	.....	.....	.....	.....	25	.....	.....
	4 47 52	.....	.....	− 2.2	.....	(25)	.....	.....
	4 48 8	.....	− 1.9	.....	.....	25	.....	.....
	4 48 23	499.9	.....	.....	− 2.2	(25)	1.0	3,520.9
	4 48 39	.....	.....	.....	.....	25	.....	.....
60	4 49 31	.....	.....	− 2.2	.....	.....	.....	.....
61	4 50 6	.....	.....	− 3.1	.....	.....	.....	.....
	4 50 22	.....	− 2.9	.....	.....	.....	.....	.....
	4 50 31	492.7	.....	.....	− 3.1	(25)	0.9	3,694.3
62	4 50 59	.....	.....	− 3.0	.....	.....	.....	.....
	4 51 9	.....	− 3.1	.....	.....	.....	.....	.....
	4 51 19	.....	.....	.....	.....	25	.....	.....
	4 51 29	490.7	.....	.....	− 3.3	(25)	0.9	3,665.6
63	4 52 3	.....	.....	− 3.6	.....	.....	.....	.....
	4 52 14	.....	− 3.5	.....	.....	.....	.....	.....
	4 52 26	.....	.....	.....	.....	25	.....	.....
	4 52 38	487.7	.....	.....	− 2.9	(25)	0.9	3,713.4
64	4 53 14	.....	.....	− 2.2	.....	.....	.....	.....
	4 53 27	.....	− 1.4	.....	− 2.9	.....	.....	.....
65	4 53 59	482.1	.....	.....	− 2.1	(25)	1.0	3,803.9
	4 54 18	.....	.....	− 2.0	.....	.....	.....	.....
66	4 54 58	478.4*	.....	.....	− 2.8	(25)	0.9	3,864.4
	4 55 19	.....	.....	− 2.8	.....	.....	.....	.....
67	4 55 54	479.1*	.....	.....	− 2.8	(25)	0.9	3,852.1
	4 56 8	.....	.....	− 2.8	.....	.....	.....	.....
68	4 56 38	477.4*	.....	.....	− 2.9	(25)	0.9	3,879.9
	4 56 53	.....	.....	− 3.0	.....	.....	.....	.....
69	4 57 53	475.4*	.....	.....	− 3.1	(25)	0.9	3,912.2
	4 58 7	.....	.....	− 3.2	.....	.....	.....	.....
	4 58 20	.....	− 3.1	.....	.....	.....	.....	.....
70	4 58 49	473.1*	.....	.....	− 3.5	(25)	0.9	3,949.9
	4 59 4	.....	.....	− 3.6	.....	.....	.....	.....
71	4 59 49	469.3*	.....	.....	− 4.6	(25)	0.8	4,015.2
	5 0 3	.....	.....	− 4.6	.....	.....	.....	.....
72	5 6 34	467.3*	.....	.....	− 8.0	(25)	0.6	4,046.5
	5 6 42	.....	.....	− 8.0	.....	.....	.....	.....
73	5 6 58	468.9*	.....	.....	− 8.0	(25)	0.6	4,019.9
	5 7 6	.....	.....	− 8.0	.....	.....	.....	.....
74	5 7 23	469.8*	.....	.....	− 8.0	(25)	0.6	4,005.0
	5 7 30	.....	.....	− 8.0	.....	.....	.....	.....
75	5 33 4	.....	.....	− 0.5	.....	.....	.....	.....
76	5 33 29	539 5	.....	.....	.....	.....	.....	2,911.6
77	5 34 4	531.1*	.....	.....	0.0	(26)	1.2	2,948.8
	5 34 29	.....	.....	+ 0.2	.....	.....	.....	.....
78	5 35 39	.....	.....	− 0.5	.....	.....	.....	.....
79	5 35 59	.....	.....	− 0.5	.....	.....	.....	.....
80	5 36 18	554.8*	.....	.....	+ 0.5	(26)	1.8	2,686.8
	5 36 26	.....	.....	+ 1.0	.....	.....	.....	.....
81	5 36 56	562.3*	.....	.....	+ 0.9	(26)	1.3	2,579.0
	5 37 18	.....	.....	+ 0.8	.....	.....	.....	.....
82	5 38 3	.....	.....	+ 1.2	.....	.....	.....	.....
83	5 38 54	567.9*	.....	.....	+ 1.0	(26)	1.2	2,499.2
	5 39 8	.....	.....	+ 1.0	.....	.....	.....	.....
84	5 43 4	576.9*	.....	.....	+ 2.3	(26)	1.5	2,372.2
	5 43 18	.....	.....	+ 2.3	.....	.....	.....	.....
	5 43 33	.....	.....	.....	.....	26	.....	.....
85	5 46 14	571.9*	.....	.....	+ 2.3	(27)	1.5	2,442.2
	5 46 28	.....	.....	+ 2.3	.....	.....	.....	.....
	5 46 43	.....	.....	.....	.....	27	.....	.....
86	5 49 42	.....	.....	+ 1.5	.....	.....	.....	.....
	5 50 27	.....	.....	.....	.....	26	.....	.....
87	5 51 4	579.0*	.....	.....	+ 1.2	(26)	1.3	2,342.4
	5 51 18	.....	.....	+ 1.2	.....	.....	.....	.....
88	5 55 41	576.9*	.....	.....	+ 1.7	(26)	1.4	2,371.5
	5 56 3	.....	.....	+ 1.7	.....	.....	.....	.....
	5 56 25	.....	.....	.....	.....	25.5	.....	.....
89	5 57 24	576.9*	.....	.....	+ 0.9	(25)	1.2	2,371.0
	5 57 38	.....	.....	+ 1.0	.....	.....	.....	.....
90	5 59 24	587.0*	.....	.....	+ 0.7	(26)	1.2	2,231.5
	5 59 38	.....	.....	+ 0.7	.....	.....	.....	.....
91	6 1 34	604.0*	.....	.....	+ 0.7	(27)	1.3	2,002.1
	6 1 48	.....	.....	+ 0.7	.....	.....	.....	.....
92	6 12 4	667.0	.....	.....	+ 8.0	(35)	2.8	1,192.0
	6 12 18	.....	.....	+ 8.0	.....	.....	.....	.....
	6 12 33	.....	.....	.....	.....	(38)	.....	.....
93	6 18 24	687.0	.....	.....	+ 9.5	(38)	3.6	946.5
94	6 14 28	692.0*	.....	.....	+11.0	(38)	3.7	885.0
	6 14 42	.....	.....	+11.0	.....	.....	.....	.....

THE GULF STREAM MYTH.

By HARVEY MAITLAND WATTS.

There are few things more curious to-day than the defer-

ence paid in educational circles and in the newspapers to exploded theories as to climate and weather causation. Of all cases of adherence to the old beliefs, the abandoned camp of an earlier, cruder science, the remarkable deference paid the Gulf Stream theory of climate is particularly a case in point. This comes naturally from the failure to grasp the essential facts of the atmospheric circulation in the north temperate zone, whose unfailing west to east drift, broken up into two eddies, the cyclonic and the anticyclonic, distributes weather and conditions climate. Once grasp what this west to east drift means and the explanation of climate and weather is an open book. Though the theory still persists that the Gulf Stream alone by its own inherent warmth causes the mild climate of northwestern Europe, and though it is still referred to in a familiar off-hand manner by school teachers in teaching physical geography and by writers who ought to know better, as one refers to the existence of Saturn's rings, yet most people seem unfamiliar with the broader restatements of the problem now made by meteorologists.

By itself alone the Gulf Stream has as much effect on the climate of northwestern Europe as the fly in the fable had in carrying the stagecoach up the hill. The mild climate of northwestern Europe is due, not to the Gulf Stream, but to the prevailing eastward and northeastward drift of the circumpolar atmospheric circulation, whose aerial currents, and not the Gulf Stream, distribute the heat conserved by the whole Atlantic Ocean north of latitude 35° (roughly) over Europe. The entire surface of the Atlantic Ocean north of the region of the trade winds, or rather, north and west of the center of the great north Atlantic anticyclone, is drifted to the northeast by the prevailing aerial drift, which drift, and not the ocean currents, carries the beneficent influences of the ocean over the European islands and the shores to the east and northeast. The Gulf Stream, itself a result of wind motion, being produced by the joint action of the Atlantic anticyclones, is not distinguishable in temperature or "set" from the rest of the ocean by the time it gets east of Newfoundland, yet it has been given the credit that belongs to the whole mass of the Atlantic, so far as the latent power to effect climate is concerned, while at the same time the determining function played by the aerial currents of the great circumpolar drift is completely ignored. The same fallacy prevails as to the power of the Japan current to affect the coastal climate of northwestern North America.

Perhaps the most amusing recent instance of repetition of all the old rhetoric and all the old error about the Gulf Stream is in an article by Mr. F. T. Bullen, in the London Spectator, which, written in a high class publication and in the name of science, merits attention and correction. Mr. Bullen says:

> But who among us with the slightest smattering of physiography is there that is not assured that but for the genial warmth of this mighty sea-river our islands would revert to their condition at the Glacial Period; who is there but feels a shiver of dread pass over his scalp when he contemplates the possibility of any diversion of its life-giving waters from our shores? The bare suggestion of such a calamity is most terrifying

Now, as a mere matter of climatic fact, were the aerial drift, that is, the circulation of the atmosphere in the north temperate zone, to remain as it is today, and were by any possibility the Gulf Stream to be diverted at the Straits of Florida, no one in England would be a whit the wiser, for it is the aerial drift that has the gift of mildness in its flow. The diversion-of-the-Gulf-Stream bogey may impress those who have a "smattering of physiography," but it has no terror for him who knows that the Gulf Stream myth has nothing to rest on save the bad science of fifty years ago and its recrudescence in the present.

Naturally, wrong about the Gulf Stream, Mr. Bullen is so blind to the facts that modern meteorology has established, that, having endowed the Gulf Stream with virtues and influences that do not belong to it, he naturally does the same for the Kuroshiwo, the Japan current. He says of it: "It is, however, but a poor competitor in beneficence in comparison with our own Gulf Stream, as those who know their Japan in winter can testify." Now, the real fact about this is (and the same is true of the lack of effect of the Gulf Stream on the climate of New York) that since the aerial drift over Japan and over the eastern United States is from west to east, the mitigating effects of the ocean and of currents that lie to the east of the coast, are naturally not carried over the land but eastward over the water. Reverse the aerial current around the world, and Japan, by the mitigating influences of the Pacific Ocean, would have an eternal spring for its climate; while the Atlantic coast States, from North Carolina to Newfoundland would have the mildness of Bermuda, not, however, on account of any one ocean current that laved their shores, but because the conserved warmth of the ocean as a whole was theirs. As it is, the August hot waves, "Indian summer," the "green Christmases," the prolonged mild spells in January and February, the "anticipations of May" that often occur in March and befool the fruit trees are due not to any shifting of the Gulf Stream, but to the intrusion of the Atlantic anticyclone on our coasts. The circulation from the south, which is thus set up in connection with cyclonic areas over the lakes, or on our northern borders, while an anticyclone persists over our Southern States near the coast, is capable of the most surprising climatic effects, and at times seems actually to reverse the seasons.

A REVIEW OF PROFESSOR VERY'S MEMOIR ON ATMOSPHERIC RADIATION.

By N. E. DORSEY, dated October 24, 1900.

As the author informs us, the experiments described in this work were undertaken at the suggestion of Professor Abbe, and their object can best be understood by quoting from a letter written by Professor Abbe to the author November 24, 1891. In this he says:

> Absorption *may be* the absolute inverse of *radiation* for gases, but I don't like to assume this as to intensity, and so I beg to know whether you and Professor Keeler can not undertake the following problem: To determine the absolute radiation in calories from a unit mass of gas at given density and temperature and at ordinary temperatures; not when burning, nor when electrified, but when simply heated.

The radiation was measured by a bolometer constructed after Professor Langley's earlier, double grating pattern. It consisted of 15 strips with a total exposed area of 19 square millimeters. The galvanometer was of the four-coil type, with a suspension system weighing 350 milligrammes, the magnets varying from 9.5 to 6 millimeters in length. The period was about twenty seconds, and the sensitiveness was one division $= 3.48 \times 10^{-9}$ ampere. As used with the bolometer one division corresponds to 5×10^{-8} radim.

Professor Very defines a *radim* as "representing a unit quantity of heat, namely, one gram-water-degree-centigrade heat-unit, lost *as radiation* per square centimeter of surface per second of time, by a heated body, or transmitted by the ether as an equivalent amount of radiant energy through a normal section of one square centimeter in one second of time." But he actually uses as his standard of radiation the difference in the amounts of heat radiated per square centimeter per second to a hemisphere, by blackened copper at 100° C. and at 0° C., which he considers as equivalent to 0.0126 radim.

He employs three different methods for determining the radiation of the gases used, but discards the first as unreliable. The second is to have a jet of hot air of adjustable thickness rise in front of his bolometer and take the deflec-